

**CLAIMS**

1. A method for separating ions in a mobility analyzer having an inlet and an outlet said method comprising the following steps:
  - a. introducing a stream of ions of into an analyzing region through said inlet;
  - b. introducing laminar sheath gas flow into said mobility analyzer upstream from said analyzing region;
  - c. maintaining of said laminar sheath gas flow as substantially laminar in the said analyzing region;
  - d. providing an electrical field in said analyzing region wherein said electrical field is generated by elements separated by junctions;
  - e. using the said laminar sheath gas flow and the said electrical field to separate the ions by mobility in the said analyzing region;
  - f. collecting said separated ions within a range of electrical mobilities through said outlet.
2. A method according to 1, wherein the said inlet and said outlet are on the same element.
3. A method according to 1, wherein the voltage difference between said inlet and said outlet is zero.
4. A method according to 1, wherein the voltage difference between said inlet and said outlet is less than the maximum voltage difference between the inlet and any other element.
5. A method according to 1, wherein an ion stagnation point exist in the analyzing region.
6. A method according to 1, wherein ions are focused on said outlet.

7. A method according to 1, wherein said analyzing region is in a region where said laminar sheath gas flow is accelerating.
8. A method according to 1, wherein an electrified screen is used to provide the electric field in the analyzing region.
9. A method according to 1, wherein a conducting screen is used to collect ions.
10. A method according to 1, wherein ions are collected on the axis of the device.
11. A method according to 1, wherein the outlet for the ions is on an element which has a voltage which is repulsive to the ions.
12. A method according to 1, wherein the inlet for the ions is on the axis of the device.
13. A method for separating ions in a mobility analyzer having an inlet and an outlet said method comprising the following steps:
  - a. introducing a stream of ions of into an analyzing region through said inlet;
  - b. introducing laminar sheath gas flow into said mobility analyzer upstream from said analyzing region;
  - c. maintaining of said laminar sheath gas flow as substantially laminar in the said analyzing region;
  - d. providing an electrical field in said analyzing region wherein said electrical field is generated by elements charged to various voltages;
  - e. providing auxiliary sheath gas flows;
  - f. using the said laminar sheath gas flow said electrical field and said auxiliary sheath gas flows to separate the ions by mobility in the said analyzing region;
  - g. collecting the separated ions in said outlet.

14. A method according to 13, wherein the said inlet and said outlet are on the same element.
15. A method according to 13, wherein the voltage difference between said inlet and said outlet is zero.
16. A method according to 13, wherein the voltage difference between said inlet and said outlet is less than the maximum voltage difference between any two said elements.
17. A method according to 13, wherein ion stagnation points exist in the analyzing region.
18. A method according to 13, wherein ions are focused on said outlet.
19. A method according to 13 wherein the laminar sheath gas flow is accelerating in the analyzing region.
20. A method according to 13, wherein a conducting screen is used to collect ions.
21. A method according to 13, wherein ions are collected on the axis of the device.
22. A method according to 13, wherein the outlet for the ions is on an element which has a voltage which is repulsive to the ions.
23. A method according to 13 wherein the inlet for the ions is on the axis of the device.
24. A method according to 13 wherein said elements are separated by junctions.
25. A method for separating ions in a mobility analyzer having an inlet and an outlet said method comprising the following steps:
  - a. introducing a stream of ions into said analyzing region through said inlet;
  - b. introducing said laminar sheath gas flow into said mobility analyzer upstream from said analyzing region;
  - c. maintaining of said laminar sheath gas flow as laminar in the said analyzing region;

- d. providing an electrical field in said analyzing region by charging elements to various voltages;
  - e. the said laminar sheath gas flow and the said electrical field separate the ions by mobility in the said analyzing region;
  - f. collecting said separated ions on said outlet, said outlet being on the axis of the said analyzing region.
26. A method according to 25 wherein said elements are separated by junctions.
27. A method according to 25 wherein the voltage difference between said inlet and said outlet is zero.
28. A method according to 25 , wherein the voltage difference between said inlet and said outlet is less than the maximum voltage difference between any two said elements.
29. A method according to 25, wherein ions are focused on said outlet.
17. A method according to 25 wherein the laminar sheath gas flow is accelerating in the analyzing region.
30. A method according to 25, wherein a conducting screen is used to collect ions.
31. A method according to 25, wherein the outlet for the ions is on an element which has a voltage which is repulsive to the ions.
32. A method according to 25 wherein the inlet for the ions is on the axis of the device.
33. A method according to 25 wherein said elements are separated by junctions.
34. A method for separating ions in a mobility analyzer having an inlet and an outlet said method comprising the following steps:
- a. introducing a stream of ions into said analyzing region through said inlet;

- b. introducing laminar sheath gas flow into said mobility analyzer upstream from said analyzing region;
  - c. maintaining of said laminar sheath gas flow as laminar in the said analyzing region;
  - d. providing an electrical field in said analyzing region by charging elements to various voltages;
  - e. using said laminar sheath gas flow and the said electrical field to separate the ions by mobility in the said analyzing region;
  - f. collecting said separated ions in said outlet, said outlet being upstream from said inlet.
35. A method for separating ions in a mobility analyzer having an inlet and an outlet said method comprising the following steps:
- a. introducing a stream of ions of into an analyzing region through said inlet;
  - b. introducing laminar sheath gas flow into said mobility analyzer upstream from said analyzing region;
  - c. maintaining of said laminar sheath gas flow as substantially laminar in the said analyzing region said sheath gas flow having a Reynolds number in excess of 2000 in said analyzing region;
  - d. providing an electrical field in said analyzing region wherein said electrical field is generated;
  - e. using the said laminar sheath gas flow and the said electrical field to separate the ions by mobility in the said analyzing region;
  - f. collecting the separated ions in an outlet wherein the voltage difference between said inlet and said outlet is zero.

36. A method for separating ions in a mobility analyzer having an inlet and an outlet said method comprising the following steps:
- a. introducing a stream of ions of into an analyzing region through said inlet;
  - b. introducing laminar sheath gas flow into said mobility analyzer upstream from said analyzing region;
  - c. maintaining of said laminar sheath gas flow as substantially laminar in the said analyzing region;
  - d. providing an electrical field in said analyzing region wherein said electrical field is generated;
  - e. using the said laminar sheath gas flow and the said electrical field to separate the ions by mobility in the said analyzing region;
  - f. collecting the separated ions in an outlet wherein the voltage difference between said inlet and said outlet is less than the maximum voltage difference between any two said elements.
37. A method for separating ions in a mobility analyzer having an inlet and an outlet said method comprising the following steps:
- a. introducing a stream of ions of into an analyzing region through said inlet;
  - b. introducing laminar sheath gas flow into said mobility analyzer upstream from said analyzing region;
  - c. maintaining of said laminar sheath gas flow as substantially laminar in the said analyzing region;
  - d. providing an electrical field in said analyzing region wherein said electrical field is generated;

- e. using the said laminar sheath gas flow and the said electrical field to separate the ions by mobility in the said analyzing region;
- f. collecting the separated ions in said outlet wherein the said inlet and said outlet are on the same element.

38. A method for separating ions in a mobility analyzer having an inlet and an outlet said method comprising the following steps:

- a. introducing a stream of ions of into an analyzing region through said inlet;
- b. introducing laminar sheath gas flow into said mobility analyzer upstream from said analyzing region;
- c. maintaining of said laminar sheath gas flow as substantially laminar in the said analyzing region;
- d. providing an electrical field in said analyzing region wherein said electrical field is generated by elements charged to various voltages;
- e. using the said laminar sheath gas flow and the said electrical field to separate the ions by mobility in the said analyzing region said analyzing region containing an ion stagnation point;
- f. collecting the separated ions in an outlet wherein the voltage difference between said inlet and said outlet is less than the maximum voltage difference between said inlet and any one of said elements.